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| (21) International Application Number: PCT/DK99/00351 (22) International Filing Date: 23 June 1999 (23.06.99) (30) Priority Data: PA 199800840 29 June 1998 (29.06.98) DK (71) Applicant (for all designated States except US): BENTLE PRODUCTS AG [CH/CH]; Grabenstrasse 1, CH-6301 Zug (CH). (72) Inventor; and (75) Inventor/Applicant (for US only): AHM, Poul, Henrik [DK/ES]; Adf. Mar Bella, Atico A, Calle San Pedro, 43, E-03590 Altea (ES). (74) Agent: CHAS. HUDE A/S; H.C. Andersens Boulevard 33, DK-1553 Copenhagen V (DK). | | (81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> |
| (54) Title: GERMINATING UNIT, GERMINATING TAPE AND A METHOD OF PRODUCING GERMINATING UNITS OR GERMINATING TAPES, AS WELL AS AN ASSEMBLY FOR CARRYING OUT SAID METHOD | | |
| (57) Abstract <p>A germinating unit for germination of seeds comprises two material layers (2, 3) of paper and a seed (4) placed between said two material layers. A mixture (5) of a carrier and additives is placed between the material layers, said additives being permanently or loosely bound to said carrier by means of a binder. The seed (4) and the mixture (5) are bound to at least one of the material layers (2, 3). The two material layers are interconnected preferably at their rim portions (1') by being glued or pressed together by way of stamping. A germinating tape can be formed by means of a row of coherent germinating units. As a result the germinating unit and the germinating tape are produced in a very simple and cost-saving manner, and furthermore it is very environmentally acceptable. In addition, the germination can be efficiently controlled, and it is easy to mechanically bed out the germinating unit in the soil at a desired interval and a desired depth.</p> <div data-bbox="695 1165 1331 1354" data-label="Image"> <p>The diagram shows a cross-section of a germinating unit. It consists of two material layers, labeled 2 and 3, which are interconnected at their rim portions, labeled 1a. Between these layers is a seed, labeled 4, and a mixture, labeled 5. The mixture 5 is shown as a dark, textured area between the layers. The seed 4 is a small, oval-shaped object positioned between the layers. The entire unit is shown in a perspective view, with the rim portions 1a clearly visible.</p> </div> | | |

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Title: Germinating unit, germinating tape and a method of producing germinating units or germinating tapes, as well as an assembly for carrying out said method.

Technical Field.

The invention relates to a germinating unit for germination of seeds and comprising
5 two material layers of paper or another biodegradable material and at least one seed placed between said two material layers.

Background Art

US-PS 4,369,599 discloses a cultivation "ball" formed by an elongated sleeve containing a substrate-containing filler. The sleeve encapsulates a seed or a plant and
10 comprises at least one wall separating the plant from the substrate. The sleeve is made of a material impenetrable by the roots of the plant. The cultivation "ball" is produced in the following manner. A growth substrate is applied onto a first corrugated length of the wall material whereafter a second length of material is placed on top of the first length. Then the resulting tape is folded about its longitudinal axis
15 whereby coherent cultivation "balls" are formed. Each cultivation "ball" comprises four cavities containing the growth substrate, and a plant or a seed is placed between said four cavities. When the cultivation "ball" is too large per se, it is possible to transversely cut said ball with the result that two small cultivation "balls" are formed.

20 This cultivation "ball" is encumbered with the draw-back that it is not suited for germination of seeds, and in addition the ball is very complicated and consequently very expensive to produce.

Brief Description of the Invention

The object of the invention is to provide a germinating unit of the above type which is simple and inexpensive to produce, which furthermore is particularly suited for a controlled germination of the plant seed, and which after a completed germination is suited for being mechanically bedded out in the soil at a desired interval and a
5 desired depth as well.

The term "seed" is in this connection to be construed as covering not only natural seeds, but also growth-suited parts of plants, such as meristems or the like parts.

The germinating unit according to the invention is characterised in that a mixture of a carrier and additives is placed between the material layers, said additives being
10 permanently or loosely bound to said carrier by means of a binder, that the seed or the seeds and the mixture are attached to at least one of said material layers, and that the two material layers are joined, preferably along their rim portions by being glued and/or pressed together by way of stamping. The resulting germinating unit can be produced in a particularly simple and cost-saving manner. In addition, the germina-
15 tion can be efficiently controlled, and it is easy to mechanically bed out the germinating units in the soil at desired intervals and at a desired depth. Moreover the germinating unit is environmentally acceptable.

According to the invention the germinating unit may prior to the bedding out have been subjected to a germinating process under optimum conditions and preferably
20 such that the radicle has penetrated the seed coat in most cases. As a result the germination percentage is very high, and furthermore the germination period has been considerably reduced with the effect that an improved yield is obtained as well.

The paper may according to the invention be of a weight not exceeding 80 g/m², preferably not exceeding 50 g/m², and especially maximum 20 g/m². The paper can
25 for instance be kraft paper. In this manner the germinating unit can be produced at a low price and be provided with a suitable strength.

According to the invention at least one of the paper layers of the germinating unit may be porous, such as microporous, especially by means of a needle thickness of 0.15 to 0.30 mm, and is particularly transparent in the moist state. As a result air can easily reach the seed and the roots of the plant both before and during the germination of said seed, as well as during the continued growth of said seed.

The carrier in the germinating unit may according to the invention be vermiculite, perlite, zeolite, cellulose materials, such as oat bran, wheat bran, wood fibres, sphagnum, burned clay, rockwool or mixtures thereof.

According to the invention the additives may comprise one or more substances within: pesticides, including herbicides, insecticides, especially systemic insecticides, fungicides, virae and cultures of bacteria, cultures of fungi, such as *Trichoderma*, fungus spores, microencapsulated fungicides, eggs from useful insects, such as predatory nematodes, fertilizers, hormones, enzymes, pH-adjusting substances, carbon, clay particles, trace elements, such as molybdenum, wood fibres or wood powder, kieselguhr, surfactants, water-absorbing substances, such as superabsorbing polymer (SAP), carboxymethyl cellulose (CMD), silica and other additives with favourable effects on the germination and the growth of the plants, where several substances are available in microencapsulated form which provides the highest protection against biodegradation.

As the germinating unit comprises water-absorbing substances, it can contain more water than hitherto known at the same time as the seeds and the roots do not drown in water, but are surrounded by air almost saturated with vapour. The water reserve applies as balls or crystals of the water-absorbing substance with water and is released to the roots in response to the osmotic pressure, viz. the ratio of the salt concentration in the roots to the salt concentration outside said roots. The combination of the carrier and the additives and the binding of the latter to the carrier as well as their position relative to the seed render it possible to ensure optimum conditions

for the germination of the seed and for the continued growth of the plant.

According to the invention the binder may comprise polyvinyl alcohol or polyethylene glycol or another plant-compatible binder, such as water or water containing a polysaccharide. The latter turned out to be particularly advantageous in practice
5 because for instance the polysaccharide is able to simultaneously act as a nutrient absorbed into some of the added cultures.

Furthermore according to the invention one or more of the additives may be placed locally in areas of the germinating unit, especially by way of spraying in liquid state or by way of being put down in form of granules or powder, some of said areas of
10 the germinating unit being positioned at a large distance from the seed with the effect that the concentration of the additives reaching said seed can be kept at a low level.

According to the invention a magnetic material, such as barium ferrite, iron fillings or iron wire, may be embedded in a rim portion of the germinating unit. When many germinating units are involved, and when these germinating units are randomly
15 positioned, it is very easy to turn all these germinating units by means of a magnet owing to the magnetic material and thereby to orient them in the same direction.

According to the invention the material layers of the germinating unit may be easily penetrable by the roots and the top of the germinating plant, for instance by being provided with a plurality of holes or cuts, especially slots, whereby the roots and the
20 top can grow through said holes or cuts. In this manner it is particularly easy for the roots and the top of the plant to penetrate through the germinating unit irrespective of the orientation of said germinating unit.

The holes or cuts, especially the slots may according to the invention preferably be of a diameter of 3 to 10 mm, be substantially circular or crescent-shaped, and be
25 placed according to a regular pattern in the material layers. In this manner it is

particularly easy for the roots and the top of the plant to find their way out of the germinating unit irrespective of the orientation of said germinating unit.

The invention relates also to a germinating tape comprising a plurality of juxtaposed germinating units according to the invention. Such a germinating tape renders it possible, if desired, to separate the germinating units from the tape one by one, which proved particularly advantageous when it is desired to bed out the germinating units one by one.

According to the invention the individual germinating units may be interspaced a distance of 3 to 80 cm, and the germinating units may be interconnected by means of intermediate lengths of at least one of the two material layers, whereby the germinating tape can be used for bedding out coherent tape-shaped germinating units containing germinated seeds of plants presenting highly differing requirements to the distance between the plants.

According to the invention the germinating unit may continue directly into one another, and the transition between two succeeding germinating units may be provided with one or more cuts or weakening lines, such as arrow-shaped cuts or weakening lines with interruptions in said cuts or weakening lines, whereby magnetic, optionally current-carrying wires may extend through said interruptions. Such a germinating tape can for instance be used for bedding out the germinating units separately by means of a bedding machine where the germinating units are torn off the tape during the bedding out. These wires in the tape can be used by a sorting process for determining regularities in the germination.

The invention relates also to a method of producing germinating units or germinating tapes according to the invention, and this method is characterised in that seeds are put down in rows on a first length of material, preferably on a glue layer placed thereon, in the longitudinal direction of said length of material in such a manner that

said seeds are fixed at regular intervals in the rows, and that a mixture of a carrier and additives bound to said carrier by means of a binder is put down about each seed, and that subsequently a second length of material is placed on top of the first length of material, and that the two lengths of material are subjected to a stamping process
5 in the portions surrounding the seeds and the mixture so as to locally fix the lengths of material to one another by way of gluing and/or pressing about the individual seeds and the mixture. This method turned out to be particularly advantageous for ensuring a reliable packing of the seeds and the mixture in a closed germinating unit in such a manner that they do not fall out of said germinating unit.

- 10 A particularly simple and reliable embodiment of the method according to the invention is characterised in that the stamping is established by means of two co-acting profiled wheels or rollers, which, if desired, simultaneously provide interrupted cuts or weakening lines in the lengths of material between the seeds in the rows.

A further particularly simple embodiment of the method according to the invention
15 is characterised in that the interconnected lengths of material are longitudinally cut between the rows of seeds and optionally also transversely cut between said seeds, whereby germinating tapes or separate germinating units are provided.

The invention relates furthermore to an assembly for carrying out the method according to the invention, and this assembly is characterised in that it comprises a device
20 for advancing a first length of material in a substantially horizontal plane, a seed dispensing station for putting down seeds onto the first length of material preferably provided with a glue layer in such a manner that the seeds are arranged at regular intervals in rows extending in the longitudinal direction of said length of material, a mixture dispensing station for placing the mixture at or around each seed, a joining
25 station for lowering a second length of material onto the first length of material, a stamping station for joining the two lengths of material in the areas between the seeds and optionally for providing interrupted cuts or weakening lines between the seeds

in the rows by way of stamping, said lengths of material being locally pressed together and/or into one another around the individual seeds with the associated dispensed mixture, a cutting station with a first set of cutting means for longitudinally cutting the interconnected lengths of material between the rows of seeds, and a
5 second set of cutting means for optionally transversely cutting the interconnected lengths of material between the seeds. This assembly turned out to be particularly efficient for carrying out the method according to the invention.

Moreover, an additional station may according to the invention be coupled between the dispensing station for the mixture and the joining station, said additional station
10 dispensing additives locally to the areas of each germinating unit. As a result the seed can, if desired, be kept at a distance from the additives for a predetermined period.

Finally, the assembly may according to the invention comprise a packing station adapted to pack the germinating units or the germinating tapes preferably in such a manner that said package is shrunk about said germinating units or said germinating
15 tapes, or such that said package, such as a cardboard box, is adapted to receive a plurality of layers of the germinating units or the germinating tapes, said package optionally comprising separating sheets between the layers. In this manner it is possible in an easy manner to handle a large portion of germinating units or germinating tapes and furthermore to ensure that said germinating units or germinating
20 tapes take up minimum room in storage and in transit prior to the germination. When the package is a plastic bag, the germinating units can be kept free of moisture.

Brief Description of the Drawings

The invention is explained in detail below with reference to the accompanying drawing, in which

25

Fig. 1 is a perspective view of a germinating unit according to the invention,

Fig. 2 is a cross-sectional view of the germinating unit of Fig. 1 taken along the line A-A of Fig. 1,

Fig. 3 illustrates a germinating unit, where an iron wire is embedded in the upper rim portion,

- 5 Fig. 3a corresponds to Fig. 3, but where iron fillings are embedded instead of the iron wire,

Fig. 4 is a perspective view of a germinating tape comprising many identical germinating units,

- Fig. 5 is a perspective view of one material layer in a germinating tape, the carrier
10 appearing uniformly distributed around the seed and the additives being locally placed, i.e. the germinating tape is shown during its production,

Fig. 6 shows a germinating tape, where cuts or holes are provided in each germinating unit, the top and the root of the radicle being able to penetrate out of said germinating unit through said holes or cuts,

- 15 Fig. 7 shows a germinating tape, where the individual germinating units are arranged at a predetermined distance from one another,

Fig. 8 is a diagrammatic view of the individual steps of the method according to the invention,

Fig. 9 is a diagrammatic view of the assembly according to the invention, and

- 20 Fig. 10 is a perspective view of an additional station for dispensing the additives locally at or around each seed.

Best Mode for Carrying Out the Invention

The germinating unit 1 illustrated in Fig. 1 is to be used for germination of seeds and comprises two material layers 2 and 3 of paper or another biodegradable material and a seed 4 placed between said two material layers, cf. Fig. 2. A mixture 5 of a carrier and additives is furthermore placed between the material layers 2 and 3, said additives being permanently or loosely bound to the carrier by means of a binder not indicated. The seed and the mixture are attached to at least one of the material layers, viz. the material layer 2 in the illustrated embodiment, by means of a glue layer 6 on said material layer 2. The two material layers 2 and 3 are joined along their rim portions by being glued or pressed together by way of stamping, said gluing, however, not being indicated. The gluing or pressing can, however, be carried out at a considerable distance from the rim portions of the material layers 2 and 2, which, however, has not been illustrated.

The paper used can be of a weight not exceeding 40 g/m², preferably not exceeding 50 g/m², especially maximum 20 g/m², and for instance be kraft paper.

At least one of the paper layers 2 and 3 can be porous, such as microporous, and be particularly transparent in the moist state, whereby a predetermined amount of light can penetrate to the seed 4, if desired.

The carrier in the mixture 5 can be vermiculite, perlite, zeolite, cellulose materials, such as wood fibres, oat bran, wheat bran, sphagnum, burned clay, rockwool or mixtures thereof.

The additives of the mixture 5 can comprise one or more substances within pesticides, including herbicides, insecticides, especially systemic insecticides, fungicides, virae and cultures of bacteria, cultures of fungi, such as Trichoderma, fungus spores, microencapsulated fungicides, eggs from useful insects, such as predatory nematodes,

fertilizers, hormones, enzymes, pH-adjusting substances, carbon, clay particles, trace elements, such as molybdenum, wood fibres or wood powder, kieselguhr, surfactants, water-absorbing substances, such as superabsorbing polymer SAP), carboxymethyl cellulose (CMC), silica and other additives with favourable effects on
5 the germination and the growth of the plants.

The binder used in the mixture 5 can comprise polyvinyl alcohol or polyethylene glycol or another plant-compatible binder, such as water or water containing a polysaccharide.

10 Fig. 4 shows a germinating tape 10 formed by several germinating units 1. In Fig. 5 the upper material layer of the germinating tape has been omitted, and this Figure shows how the above additives can be dispensed locally in areas 12 of the germinating unit. Such a positioning of the additives can be ensured by said additives being
15 sprayed in liquid state or by said substances being put down in form of granules or powder. The above areas 12 can be positioned at a predetermined distance from the seed.

As illustrated in Fig. 3, a magnetic material, such as an iron wire 15, can be embedded in the rim portion of the germinating unit 1, viz. between the material layers 2 and 3. A stripe of iron fillings 15', cf. Fig. 3a, can, however, also be embedded in
20 said rim portion of the germinating unit 1. As an alternative it is also possible to insert barium ferrite.

As shown in Fig. 6, the material layers 2 and 3 of the germinating unit can be easily penetrable by the roots and the top of the germinating plant, for instance by being provided with a plurality of holes 16 or slots through which the roots and the top can
25 grow.

These holes or slots are preferably of a diameter/extent of 3 to 10 mm, and they can

be substantially circular or crescent-shaped, cf. at 16. In addition, they can be arranged in the material layers according to a regular pattern, optionally as a wide belt on a level with the seed.

The germinating units 1 in the germinating tape 10, cf. Fig. 4, can optionally be
5 separated from said tape one by one.

As shown in fig. 7, the individual germinating units 1 can be interspaced a predetermined distance of 3 to 80 cm, and in this Figure these germinating units are interconnected by means of intermediate lengths of merely one of the material layers, but two material layers may, however, also be used on this location.

10 Fig. 6 shows that the germinating units 1 can continue directly into one another, and that the transition between two succeeding germinating units can be provided with one or more cuts or weakening lines 19, such as arrow-shaped cuts or weakening lines with interruptions in said cuts or weakening lines, where magnetic, optionally current-carrying wires can extend through said interruptions, said wires not being
15 shown.

The above germinating unit can be produced from a germinating tape by the germinating units being separated from the germinating tape one by one as mentioned above.

The germinating tape is produced in the following manner. Initially, cf. the step w
20 in Fig. 8. seeds are put down onto a first length of material, preferably onto a glue layer placed on said length of material. The seeds are put down in rows in the longitudinal direction of the length of material with the result that said seeds are arranged at fixed regular intervals in said rows. Subsequently, cf. the step x in Fig. 8, a mixture of a carrier and additives bound to said carrier by means of a binder is put down
25 around each seed. Now, cf. the step y in Fig. 8, a second length of material is placed

on top of the first length of material. Finally, cf. the step \underline{z} in Fig. 8, the two lengths of material are subjected to a stamping in the portions surrounding the seeds and the mixture so as to locally attach said lengths of materials to one another by way of gluing and/or pressing about the individual seeds and the mixture. Such a method
5 turned out to be highly efficient.

The resulting germinating tape/germinating unit possess a good cohesion, which allows the top and the root of the plant to penetrate through said germinating tape/germinating unit.

The stamping can be established by means of two co-acting profiled wheels or rollers of a particular assembly, cf. below. These wheels or rollers can, if desired, simulta-
10 neously provide interrupted cuts or weakening lines in the lengths of material between the seeds in the rows.

As indicated at the step \underline{z}' , the interconnected lengths of material can be longitudinally cut between the rows of seeds with the result that germinating tapes are produced. A germinating tape is typically 10 to 40 mm wide, preferably 15 to 30 mm,
15 and each length can typically be of a width corresponding to six to twelve germinating tapes. It is possible, if desired, to cut off or press out the germinating units from each of these germinating tapes.

Fig. 9 is a diagrammatic view of an assembly for carrying out the method according to the invention. The assembly comprises a station 20, where a length of material 2' is pulled off, said length of material preferably being provided with a glue layer of the type: permanently adhesive. The assembly comprises furthermore a seed dispensing station 21 for dispensing seeds 4' onto the length of material 2'. The seeds are arranged at regular intervals in rows in the longitudinal direction of the length of
25 material. Moreover, a mixture dispensing station 22 is provided, which dispenses the previously described mixture 5 in portions onto the length of material 2' at or around

each seed 4'. The second length of material 3' is carried to a guide roller 23 and downwards and towards the second length of material 2' at a joining station 24, where said lengths of material are joined. In addition, a stamping station 25 is provided for joining the two lengths of material in the portions between the seeds. This
5 station can also provide interrupted cuts or weakening lines between the seeds in the rows by way of stamping, whereby the lengths of material are locally pressed together and/or towards one another around the individual seeds with the associated dispensed mixture. Moreover the assembly can comprise a cutting station 26 with a first set of cutting means for longitudinally cutting up the joined lengths of material
10 between the rows of seeds, and a second set of cutting means for transversely cutting up said lengths of material between the seeds, if desired, the latter cutting also being diagrammatically shown. Finally, the assembly can comprise a packing station 27 adapted to pack the ready-made germinating units or germinating tapes in such a manner that the package used is preferably shrunk about said germinating units or
15 germinating tapes.

An additional station 28 can be coupled between the station 22 and the putting down of the second length of material 3', Fig. 10 being an enlarged view of said additional station 28. This additional station is used when the previously mentioned additives must be placed locally in areas around the germinating unit, viz. the germinating
20 tape, and especially when said additives are to be applied by way of spraying in liquid state or by way of putting them down in form of granulates or powder, cf. the areas 12 in Fig. 5. A tube is provided on the bottom side of the additional station 28 for each of the desired areas 12. The additional station 28 can optionally be moved up and down, cf. the indication by way of the double arrow B to the very left of the
25 Figure.

Prior to the bedding out, the germinating unit can, if desired, be subjected to a germinating process under optimum conditions, preferably in such a manner that the radicle has penetrated the seed coat in most cases.

Figs. 1, 2 and 5 show the germinating unit provided with only one seed 14. Nothing, however, prevents each germinating unit from containing two or more seeds.

The term "biodegradable material" is in the present text to be construed as a material
5 being biodegraded within the cultivation period of the culture in question.

The invention may be modified in many ways without thereby deviating from the scope of the invention.

Claims

1. A germinating unit for germinating seeds and comprising two material layers (2, 3; 2', 3') of paper or another biodegradable material and at least one seed (4) placed between said two material layers, c h a r a c t e r i s e d in that a mixture (5) of a carrier and additives is placed between the two material layers, said additives being permanently or loosely bound to the carrier by means of a binder, that the seed (4) or the seeds and the mixture (5) are attached to at least one of the material layers (2, 3; 2', 3'), and that the two material layers are joined, preferably along the rim portions (1') by being glued or pressed together by way of stamping.
- 10 2. A germinating unit as claimed in claim 1, c h a r a c t e r i s e d in that prior to the bedding out, the germinating unit has been subjected to a germinating process under optimum conditions and preferably such that the radicle has penetrated the seed coat in most cases.
3. A germinating unit as claimed in claim 1 or 2, c h a r a c t e r i s e d in that the paper (2, 3; 2', 3') is of a weight not exceeding 80 g/m^2 , preferably not exceeding 50 g/m^2 , especially maximum 20 g/m^2 .
- 15 4. A germinating unit as claimed in claim 1, 2 or 3, c h a r a c t e r i s e d in that at least one of the paper layers (2, 3; 2', 3') of the germinating unit is porous, such as microporous, especially by means of a needle thickness of 0.15 to 0.30 mm, and is particularly transparent in the moist state.
- 20 5. A germinating unit as claimed in one of the claims 1 to 4, c h a r a c t e r i s e d in that the carrier is made of vermiculite, perlite, zeolite, cellulose materials, such as oat bran, wheat bran, wood fibres, sphagnum, burned clay, rockwool or mixtures thereof.

6. A germinating unit as claimed in one or more of the claims 1 to 5, c h a r a c t e -
r i s e d in that the additives comprise one or more substances within: pesticides,
including herbicides, insecticides, especially systemic insecticides, fungicides, virae,
cultures of bacteria, cultures of fungi, such as Trichoderma, fungus spores,
5 microencapsulated fungicides, eggs from useful insects, such as predatory nematodes,
fertilizers, hormones, enzymes, pH-adjusting substances, carbon, clay particles, trace
elements, such as molybdenum, wood fibres or wood powder, kieselguhr, surfac-
tants, water-absorbing substances, such as superabsorbing polymer (SAP) or
carboxymethyl cellulose (CMC), silica and other additives with favourable effects on
10 the germination and the growth of plants, where several substances are available in
microencapsulated form.

7. A germinating unit as claimed in one or more of the claims 1 to 6, c h a r a c -
t e r i s e d in that the binder comprises polyvinyl alcohol or polyethylene glycol or
another plant-compatible binder, such as water or water containing a polysaccharide.

15 8. A germinating unit as claimed in one or more of the claims 1 to 7, c h a r a c -
t e r i s e d in that one or more of the additives is/are placed locally in areas (12) of
said germinating unit, especially by way of spraying in liquid state or by way of
being put down in form of granules or powder.

9. A germinating unit as claimed in one or more of the claims 1 to 8, c h a r a c -
20 t e r i s e d in that magnetic material, such as barium ferrite, iron fillings (15') or
iron wire (15), is embedded in a rim portion (1') of the germinating unit.

10. A germinating unit as claimed in one or more of the claims 1 to 9,
c h a r a c t e r i s e d in that the material layers (2, 3; 2', 3') of the germinating unit
are easily penetrable by the roots and the top of the germinating plant, for instance
25 by being provided with a plurality of holes (16) or cuts, especially slots (17), where-
by the roots and the top can grow through said holes or slots.

11. A germinating unit as claimed in one or more of the claims 1 to 10, characterised in that the holes (16) or the cuts (17), especially the slots, are preferably of a diameter of 3 to 10 mm, and substantially circular or crescent-shaped, and are placed according to a regular pattern in the material layers.
- 5 12. A germinating tape (10), characterised in that it comprises a plurality of juxtaposed germinating units (1) as claimed in one or more of the claims 1 to 11, and that the germinating units can optionally be separated from the tape one by one.
- 10 13. A germinating tape as claimed in claim 12, characterised in that the individual germinating units are interspaced a distance (a) of 3 to 80 cm, and that the germinating units are interconnected by means of intermediate lengths of at least one of the two used material layers.
14. A germinating tape as claimed in claim 12, characterised in that
15 the germinating units continue directly into one another, and that the transition between two succeeding germinating units is provided with one or more cuts or weakening lines (19), such as arrow-shaped cuts or weakening lines, with interruptions in said cuts or weakening lines, whereby magnetic, optionally current-carrying wires can extend through said interruptions.
- 20 15. A method of producing germinating units or germinating tapes as claimed in one or more of the claims 1 to 14, characterised in that seeds are put down in rows on a first length of material, preferably on a glue layer placed thereon, in the longitudinal direction of said length of material in such a manner that said seeds are fixed at regular intervals in the rows, and that a mixture of a carrier and
25 additives bound to said carrier by means of a binder is put down about each seed, and that subsequently a second length of material is placed on top of the first length of material, and that the two lengths of material are subjected to a stamping process in

the portions surrounding the seeds and the mixture so as to locally fix the lengths of material to one another by way of gluing and/or pressing about the individual seeds and the mixture.

16. A method as claimed in claim 15, c h a r a c t e r i s e d in that the
5 stamping is established by means of two co-acting profiled wheels or rollers, which, if desired, simultaneously provide interrupted cuts or weakening lines in the lengths of material between the seeds in the rows.

17. A method as claimed in claim 15 or 16, c h a r a c t e r i s e d in that the
10 interconnected lengths of material are longitudinally cut between the rows of seeds and optionally also transversely cut between said seeds, whereby germinating tapes or separate germinating units are provided.

18. An assembly for carrying out the method as claimed in one or more of the
claims 15 to 17, c h a r a c t e r i s e d in that it comprises a device for advancing
a first length of material (2') in a substantially horizontal plane, a seed dispensing
15 station (21) for putting down seeds onto the first length of material (2') preferably provided with a glue layer in such a manner that the seeds (4) are arranged at regular intervals in rows extending in the longitudinal direction of said length of material, a mixture dispensing station (22) for placing the mixture (5) at or around each seed, a joining station (24) for lowering a second length of material onto the first length
20 of material, a stamping station (25) for joining the two lengths of material in the areas between the seeds (4') and optionally for providing interrupted cuts or weakening lines (19) between the seeds in the rows by way of stamping, said lengths of material (2', 3') being locally pressed together and/or into one another around the individual seeds with the associated dispensed mixture, a cutting station (26) with a
25 first set of cutting means for longitudinally cutting the interconnected lengths of material between the rows of seeds, and a second set of cutting means for optionally transversely cutting the interconnected lengths (2', 3') of material between the seeds.

19. An assembly as claimed in claim 18, characterised in that an additional station (28) is coupled between the dispensing station (22) for the mixture and the joining station (24), said additional station dispensing additives locally to the areas (12) of each germinating unit (1).

- 5 20. An assembly as claimed in claim 18 or 19, characterised in that it comprises a packing station (27) adapted to pack the germinating units or the germinating tapes preferably in such a manner that said package is shrunk about said germinating units or said germinating tapes, or such that said package, such as a cardboard box, is adapted to receive a plurality of layers of germinating units or
10 germinating tapes, said package optionally comprising separating sheets between the layers.

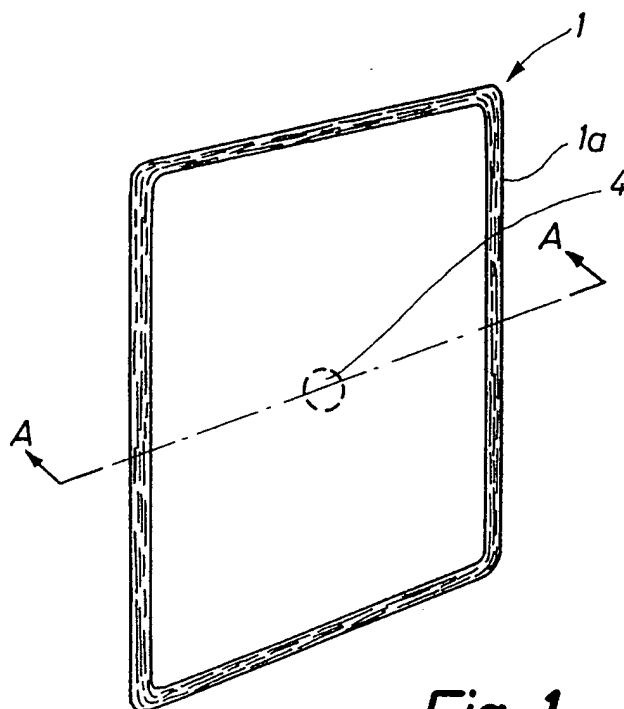


Fig. 1

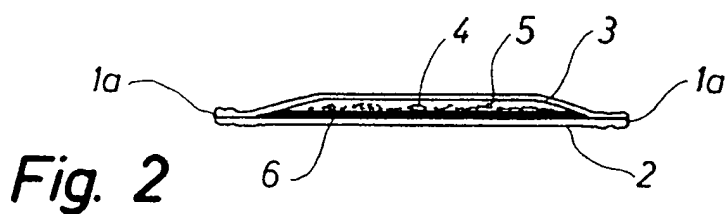


Fig. 2

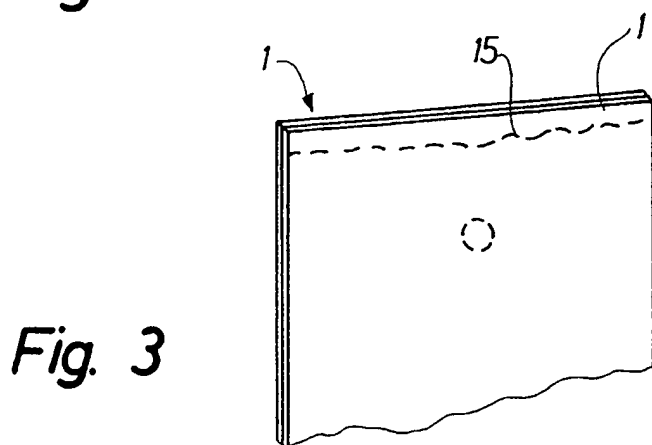


Fig. 3



Fig. 3a

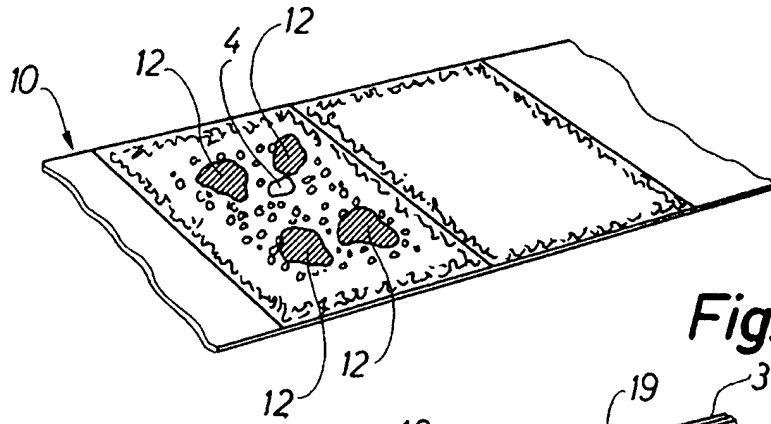


Fig. 5

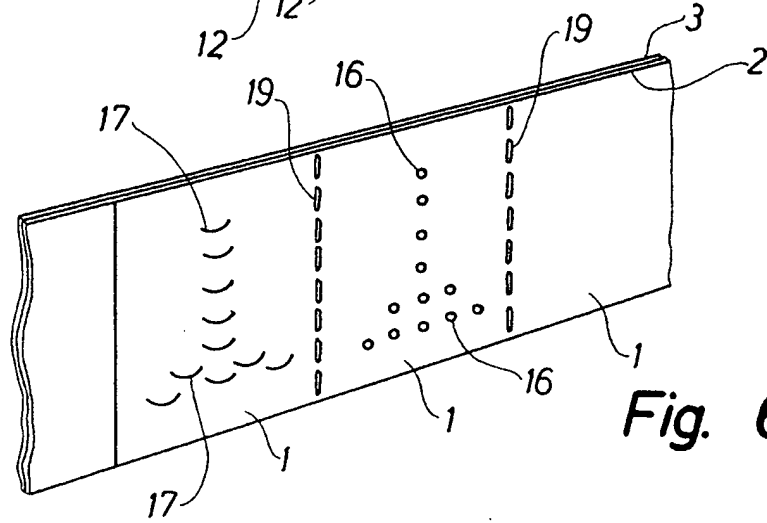


Fig. 6

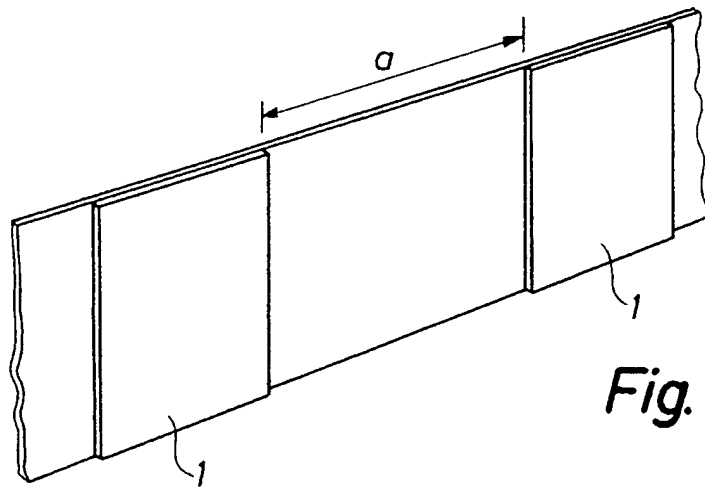
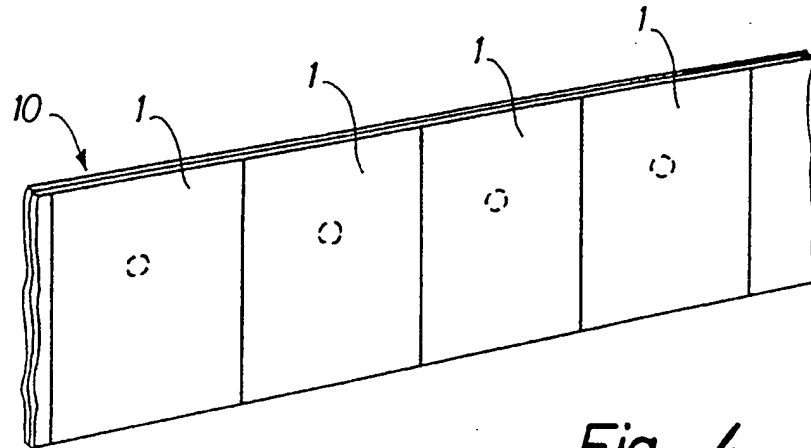
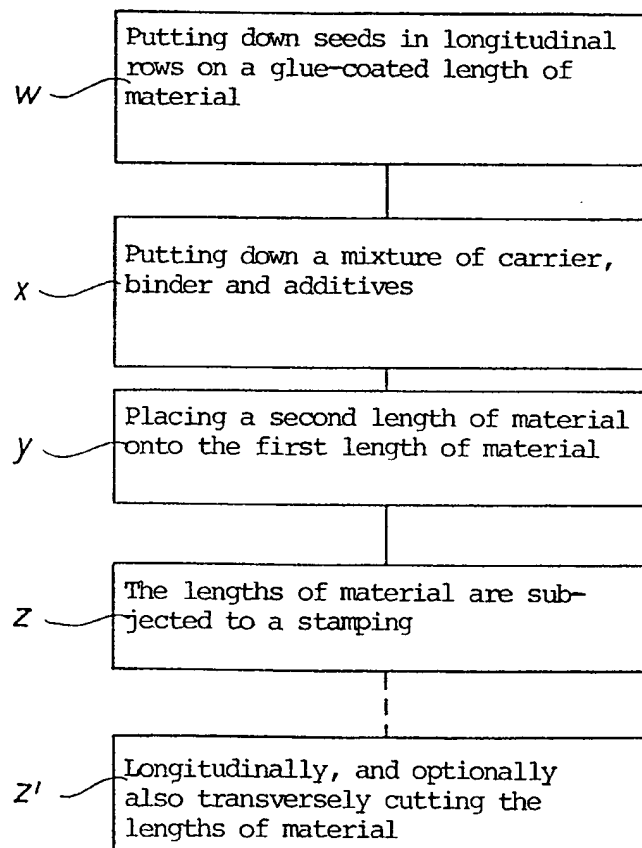
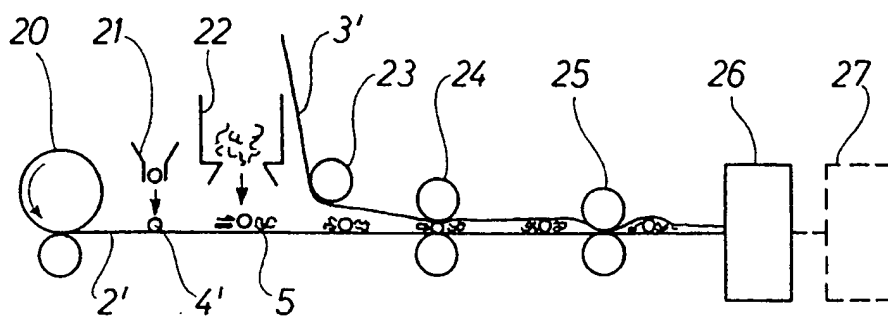
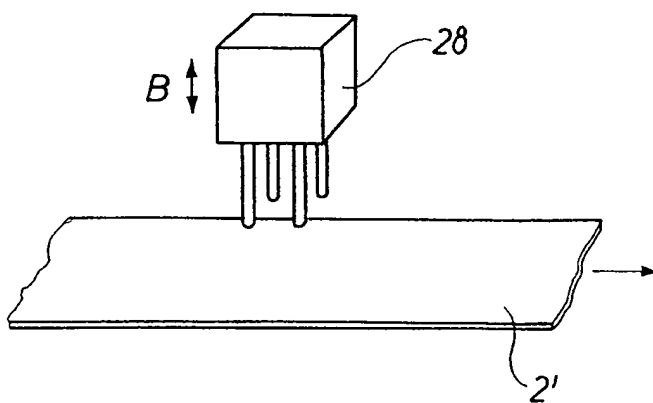


Fig. 7

*Fig. 4**Fig. 8*

**Fig. 9****Fig. 10**

INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 99/00351

| A. CLASSIFICATION OF SUBJECT MATTER | | |
|---|---|---|
| IPC6: A01C 1/04 According to International Patent Classification (IPC) or to both national classification and IPC | | |
| B. FIELDS SEARCHED | | |
| Minimum documentation searched (classification system followed by classification symbols) | | |
| IPC6: A01C, A01G | | |
| Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched | | |
| SE,DK,FI,NO classes as above | | |
| Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) | | |
| WPI | | |
| C. DOCUMENTS CONSIDERED TO BE RELEVANT | | |
| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
| Y | GB 2123663 A (ITT INDUSTRIES LIMITED (UNITED KINGDOM)), 8 February 1984 (08.02.84), claims -- | 1-20 |
| Y | GB 2142213 A (TOKUGAWAEN CO LTD (JAPAN)), 16 January 1985 (16.01.85), page 1, line 81 - line 92 -- | 1-20 |
| A | US 5081791 A (G. BARON ET AL), 21 January 1992 (21.01.92), claim 6, abstract ----- | 1-20 |
| <input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex. | | |
| * Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "I:" earlier document but published on or after the international filing date "I." document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family | | |
| Date of the actual completion of the international search | | Date of mailing of the international search report |
| 16 Sept 1999 | | 19 -10- 1999 |
| Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86 | | Authorized officer Ingrid Falk / MR Telephone No. +46 8 782 25 00 |

INTERNATIONAL SEARCH REPORT

Information on patent family members

30/08/99

International application No.

PCT/DK 99/00351

| Patent document cited in search report | | | Publication date | Patent family member(s) | Publication date |
|---|---------|---|---------------------|----------------------------|---------------------|
| GB | 2123663 | A | 08/02/84 | NONE | |
| GB | 2142213 | A | 16/01/85 | AU 561087 B | 30/04/87 |
| | | | | AU 2854584 A | 28/11/85 |
| | | | | FR 2565776 A,B | 20/12/85 |
| US | 5081791 | A | 21/01/92 | AT 57058 T | 15/10/90 |
| | | | | AU 598783 B | 05/07/90 |
| | | | | AU 6727687 A | 01/07/87 |
| | | | | CA 1320640 A | 27/07/93 |
| | | | | EP 0230799 A,B | 05/08/87 |
| | | | | SE 0230799 T3 | |
| | | | | FR 2590761 A,B | 05/06/87 |
| | | | | GR 3001106 T | 12/05/92 |
| | | | | JP 63501768 T | 21/07/88 |
| | | | | PT 83833 A,B | 01/12/86 |
| | | | | WO 8703168 A | 04/06/87 |